REMARKS

This Amendment is in response to the final Office Action mailed on April 20, 2009. Claim 5 is amended and is supported, for example, in the specification on page 4, line 28-page 5, line 4. No new matter is added. Claims 5 and 7-9 are pending with claims 10 and 11 being withdrawn.

Claim Amendments:

Claim 5 is amended to recite an "accelerated electron beam" and is supported, for example, in the specification on page 4, line 28-page 5, line 4. Even if this portion does not explicitly state an "accelerated electron beam", it would be understood by one skilled in the art that the electron beam source must emit an accelerated electron beam in order to be capable of evaporating the first thin film material by heating.

§103 Rejections:

Claims 5, 7 and 9 are rejected as being unpatentable over DeLozanne (US Patent No. 5,004,721) in view of Higuchi (US Patent No. 5,079,224). This rejection is traversed.

Claim 5 is directed to an apparatus for manufacturing a thin film in which the thin film is formed on a supporting base that recites, among other features, a path along which the accelerated electron beam emitted from the electron beam source reaches the electron beam evaporation source intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor-deposited.

The combination of DeLozanne and Higuchi does not teach or suggest these features. The rejection relies on Higuchi for teaching that a path along which the electron beam emitted from the electron beam source reaches the electron beam evaporation source intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor-deposited. However, Higuchi does not teach or suggest that the path of an accelerated electron beam intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor-deposited. In contrast, Higuchi merely teaches the use of thermionic beam generators (41, 42 and 43) to radiate thermionic beams to the streams of metallic elements oriented

toward the substrate (5) from the crucibles (11, 12 and 13) so as to partially ionize the metallic streams (see column 3, lines 37-42 of Higuchi). As described in the enclosed portion on thermal ionization from the Encyclopedia Britannica website, thermionic beams use a small energy spread characteristic of a few tenths of an electron bolt, as compared with beam energies of thousands of electron volts. Thus, thermionic beams cannot be considered as an accelerated electron beam (see http://www.britannica.com/EBchecked/topic/368325/mass-spectrometry/80540/Thermal-ionization#ref=ref619882). Also, nowhere does Higuchi teach or suggest that its thermionic beams are provided to collide with a vapor stream of a metallic material. Thus, it would not be obvious to one skilled in the art to modify the configuration of DeLozanne in order to provide a path along which the accelerated electron beam intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor-deposited, based on Higuchi. For at least these reasons claim 5 is not suggested by the combination of DeLozanne and Higuchi and should be allowed. Claims 7 and 9 depend from claim 5 and should be allowed for at least the same reasons.

Claim 8 is rejected as being unpatentable over DeLozanne in view of Higuchi and further in view of Suzuki (US Patent No. 4,622,919). This rejection is traversed. Claim 8 depends from claim 5 and should be allowed for at least the same reasons described above. Applicants do not concede the correctness of this rejection.

Conclusion:

Applicants respectfully assert that claims 5 and 7-9 are in condition for allowance. If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Douglas P. Mueller (Reg. No. 30,300), at (612) 455-3804.

Respectfully submitted,

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General principles » Ion sources » Thermal ionization

Atoms with low **ionization potentials** can be ionized by contact with the heated surface of a metal, generally a filament, having a high work function (the energy required to remove an electron from its surface) in a process called thermal, or surface, ionization. This can be a highly efficient method and has the experimental advantage of producing ions with a small energy spread characteristic of the filament temperature, typically a few tenths of an **electron volt**, as compared with beam energies of thousands of electron volts. The filaments, generally made of platinum, rhenium, tungsten, or tantalum, are heated by current. Surface ionization requires a nearby source of atoms, often another filament operating at lower temperatures. Samples can also be loaded directly on the filament, a widely used and successful technique and one that has resulted in many interesting chemical treatments of the sample when it is deposited on the filament. One such application changed lead from a difficult to an easy element to analyze, enabling important geochronological and environmental measurements. A disadvantage of thermal ionization is the possible change in isotopic composition during the measurement. This effect is caused by Rayleigh distillation, wherein light isotopes evaporate faster than heavy ones. Studies done on isotopes that come from radioactive decay, such as those used in determining the ages of rocks, encounter this problem, but it is correctable using the measured values of the isotopes that are not radiogenic. With few exceptions the use of a thermal source requires the **chemical separation** of the sample. Useful data are commonly obtained on extremely small (*e.g.*, nanogram) samples.